Math 0350 Practice Test **Unit Four**
Chapter 12 and 13.1 **Martin-Gay 4th edition**

If $f(x)=3x-1,\ g(x)\ =\ x-5,\ and\ h(x)=\ x^2-3$, find the following

1. $(f\cdot g)(x)$ 2. $(g-f)(x)$ 3. $(g\circ h)(x)$ 4. $(f\circ g)(1)$

Solution 1: $(f\cdot g)(x)=f(x)\cdot g(x)=(3x-1)(x-5)=3x^2-15x-x+5=3x^2-16x+5$

Solution 2: $(g-f)(x)=g(x)-f(x)=(x-5)-(3x-1)=x-5-3x+1=-2x-4$

Solution 3: $(g\circ h)(x)=g\left(h(x)\right)=\underbrace{\left(x^2-3\right)}_{h(x)}-5=x^2-8$

Solution 4: $(f\circ g)(1)=f\left(g(1)\right)=3\underbrace{(1-5)}_{g(1)}-1=-12-1=-13$

5. On the same set of axes graph the one-to one function, $f(x)=2x-2$ and its inverse. Write the equation of f^{-1}.

Solution:

I. Write $f(x)$ as y: $y=2x-2$

II. Exchange x and y: $x=2y-2$

III. Solve for y:

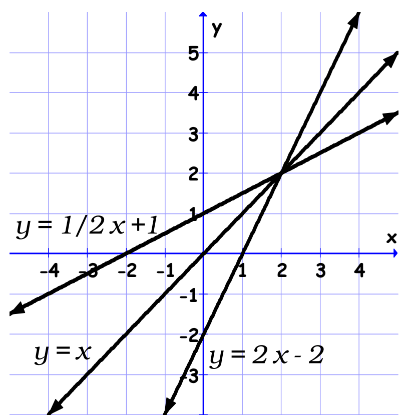
$x=2y-2$

$x+2=2y$

$\frac{x+2}{2}=y$

IV. Rewrite in terms of $f^{-1}(x)$.

$f^{-1}(x)=\frac{x+2}{2}=\frac{1}{2}x+1$



Use the properties of logarithms to write each expression as a single logarithm.

6. $\log_2 6+\log_2 5-\log_2 3$

Solution: $\log_2 6+\log_2 5-\log_2 3=\log_2\frac{6(5)}{3}=\log_2 10$

7. $4\log x + \log(x+7) - \log x^2$

Solution: $4\log x + \log(x+7) - \log x^2 = \log x^4 + \log(x+7) - \log x^2 = \log \dfrac{x^4\left(x+7\right)}{x^2} = \log x^2\left(x+7\right)$

8. Express $\log_5\left(\dfrac{x^3\left(x+5\right)^2}{\sqrt[3]{x-1}}\right)$ as a sum and/or difference of multiples of logarithms.

Solution: $\log_5\left(\dfrac{x^3\left(x+5\right)^2}{\sqrt[3]{x-1}}\right) = \log_5 x^3 + \log_5\left(x+5\right)^2 - \log_5\left(x-1\right)^{\frac{1}{3}} = 3\log_5 x + 2\log_5\left(x+5\right) - \dfrac{1}{3}\log_5\left(x-1\right)$

9. Use the change of base property to approximate $\log_5 8$ to four decimal places.

Solution: $\log_5 8 = \dfrac{\log 8}{\log 5} = 1.2920$

10. Solve for x: $\log_3 \dfrac{1}{27} = x.$

Solution: $\log_3 \dfrac{1}{27} = x$

$$3^x = \frac{1}{27}$$
$$3^x = 3^{-3}$$
$$x = -3$$

11. Solve $2^{(3x-1)} = 6$ for x. Give an exact solution and also approximate the solution to four decimal places.

Solution: $2^{(3x-1)} = 6$

$$\log_2 6 = 3x - 1$$
$$\left(\log_2 6\right) + 1 = 3x$$
$$\frac{\left(\log_2 6\right)+1}{3} = x$$
$$x = \frac{\frac{\log 6}{\log 2} + 1}{3} \approx 1.1950$$

Solve each logarithmic equation for x. Give an exact solution.

12. $\log_4 x = 3$

Solution: $x = 4^3 = 64$

13. $\ln e^3 = x$

Solution: Property of logarithms: $x = 3$

14. $\log_3(4x+1) = 2$

Solution: $3^2 = 4x+1$

$$
\begin{aligned}
9 &= 4x+1 \\
8 &= 4x \\
2 &= x
\end{aligned}
$$

15. $\log_7 4 + \log_7 x = 1$

Solution: $\log_7 4x = 1$

$$
\begin{aligned}
4x &= 7^1 \\
x &= \frac{7}{4}
\end{aligned}
$$

16. $\log(x+1) - \log(x-2) = 2$

Solution: $\log \dfrac{(x+1)}{(x-2)} = 2$

$$
\begin{aligned}
10^2 &= \frac{x+1}{x-2} \\
100(x-2) &= x+1 \\
100x - 200 &= x+1 \\
99x &= 201 \\
x &= \frac{201}{99}
\end{aligned}
$$

17. $3^{\log_3 x} = 5$

Solution: Property of logarithms: $x = 5$

18. $\log_x 4 = 2$

Solution: $x^2 = 4; \quad x = 2$

19. Solve $\ln(5x-6) = 3$ accurate to four decimal places.

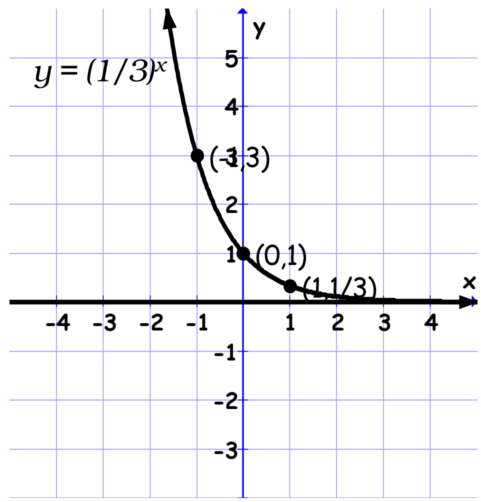
Solution: $e^3 = 5x - 6$

$$\frac{e^3 + 6}{5} = x$$
$$x = 5.2171$$

20. Graph the function: $f(x) = \left(\frac{1}{3}\right)^x$. Label three exact points and list the domain and range.

Solution:

x	$f(x) = \left(\frac{1}{3}\right)^x$
-1	3
0	1
1	$\frac{1}{3}$

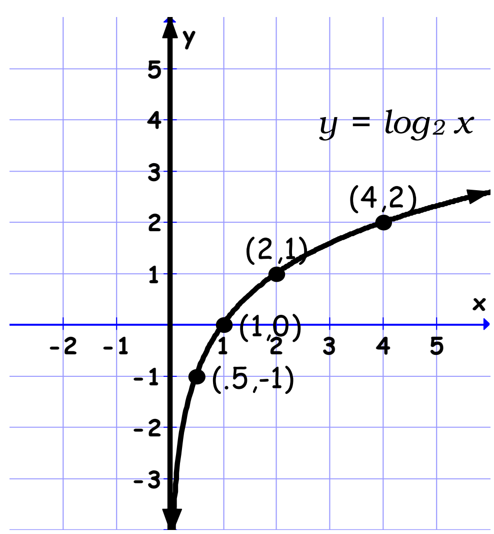


Domain: $(-\infty, \infty)$ Range: $(0, \infty)$

21. Graph the function $g(x) = \log_2 x$. Label three exact points and list the domain and range.

Solution:

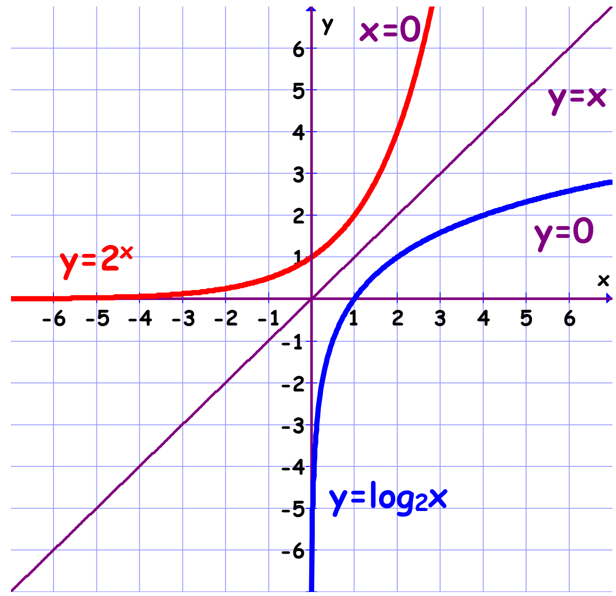
x	$y = \log_2 x$
$\frac{1}{2}$	-1
1	0
2	1



Observe the inverse property of the log function: The inverse of $g(x)=\log_2(x-1)$ is:

1. $y=\log_2 x$
2. $x \leftrightarrow y$: $x=\log_2 y$
3. Solve for y: $2^x = y$
4. Graph the exponential function:

x	$y=2^x$
-1	$\frac{1}{2}$
0	1
1	2



Both graphs are symmetrical in respect of y = x

The horizontal asymptote y=0 changed to a vertical asymptote x = 0.

Domain: $(0,\infty)$ Range: $(-\infty,\infty)$

22. Determine the future value A = $P\left(1+\frac{r}{n}\right)^{nt}$ of \$8,000 deposited in a certificate of deposit if it earns 6% compounded monthly after 2 years.

Solution: The formula for the accumulated value is: $A=P\left(1+\frac{r}{n}\right)^{nt}$, where:

P = the present value,

n = the number of compound periods per year,

r = rate in percents,

t = years.

In the example: P = \$8 000; n = 12; r = 0.06; t = 2.

$$A=8000\left(1+\frac{0.06}{12}\right)^{12(2)}$$

The correct answer is most likely to be achieved if we follow the following steps using the calculator:

Step 1: Calculate the fraction $\dfrac{0.06}{12}$.  Result: .005

Step 2: Click: 1 + 

Result: 1.005

Step 3: Click:  (calculate 12*2 by hand) 24 Result: 1.127159776

Step 4: Click:  8000 Result: 9017.27821

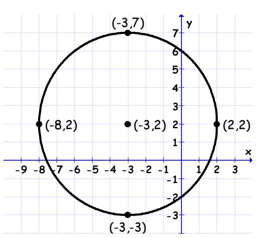
Answer: $ 9017.28

23. Write the standard form of the equation of the circle whose radius is 3 and whose center is (2, -1).

Solution: The standard form of the equation of the circle is $(x-h)^2+(y-k)^2=r^2$, where the center is $(h,k)=(2,-1)$ and $r=3$. So: $(x-2)^2+(y+1)^2=9$

24. Sketch a graph of the circle: $(x+3)^2+(y-2)^2=25$. Label the center and 4 exact points which lie on the circle.

Solution: The standard form of the equation of the circle is $(x-h)^2+(y-k)^2=r^2$, where the center is $(-3,2)$, the radius is 5



25. Sketch a graph of the circle: $x^2+y^2=49$. Label the center and 4 exact points which lie on the circle.

Solution: Center: $(0,0)$ Radius: 7